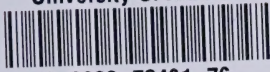


University Of Alberta



0 0000 70481 76

CURRICULUM

QL

673

B 62

1977

Tch, Gd.

CURR

J.C. MacBean

A. Stecher

D.F. Wentworth

J.K. Couchman

Examining Your Environment



Birds

A GUIDE FOR TEACHERS



QL
673
B62
1977
tch.gd.

CURR

EX LIBRIS
UNIVERSITATIS
ALBERTAENSIS



Alberta Heritage Savings Trust Fund
Library Development Grant

Examining Your Environment

Birds

A GUIDE FOR TEACHERS

John C. MacBean

Adam Stecher

Daniel F. Wentworth

J. Kenneth Couchman

Holt, Rinehart and Winston of Canada, Limited
Toronto

John C. MacBean
Social and Environmental Studies Consultant
Niagara South Board of Education
Port Colborne, Ontario

Adam Stecher
Assistant Superintendent
Perth County Board of Education
Stratford, Ontario

Daniel F. Wentworth
Science Consultant
Hamilton Board of Education
Hamilton, Ontario

J. Kenneth Couchman
Co-ordinator of Programs, Junior Division
Hamilton-Wentworth Roman Catholic Separate School Board
Hamilton, Ontario

Copyright © 1975

HOLT, RINEHART AND WINSTON OF CANADA, LIMITED

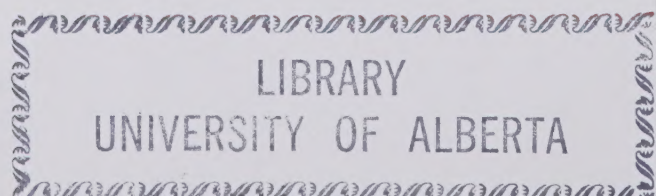
All Rights Reserved

ISBN 0-03-922157-1

It is illegal to reproduce any portion of this book except by special arrangement with the publishers. Reproduction of this material without authorization by any duplication process whatsoever is a violation of the copyright.

Printed in Canada

3 4 5 79



CONTENTS

Introduction	iv
<i>Selecting Activities</i>	iv
<i>Guiding Student Inquiry</i>	v
<i>How to Use this Guide</i>	vii
1 Live Birds	1
2 Birds' Eggs	8
3 Birds' Nests	13
4 Dead Birds	18
Bibliography	23

INTRODUCTION

The study of birds as outlined in this book is intended to give the beginner a new and fresh way to look at birds other than simply identifying them. It is primarily an examination of common birds and their characteristics as related to their habits, eggs, nests and physical features. All too often the study of birds emphasizes the identification techniques of birds in the field. Although this is a fundamental pillar of ornithology, bird identification, difficult even for teenagers and adults, tends to become impractical and complex when working with thirty or more students in a classroom in a large urban center.

Birds deals with activities that usually can be directly observed and measured in the classroom or in areas close at hand. The main idea of these activities is to develop a better understanding for birds after doing some first-hand research about them. It is hoped that sufficient interest will be sparked to allow the students to continue, in their own manner and in greater depth, the study of birds.

Selecting Activities

Although some bird studies can be conducted at any time of the year, the best results for some of the activities will usually be found during the spring, summer and autumn. However, availability of certain materials should dictate the choice of activities before seasonal conditions.

Chapter

Time of Year

- | | |
|-----------------|--|
| 1. Live Birds | This chapter could quite easily be done during the late spring and early summer. The activity dealing with the bird feeders, if it is to be done, should be started as soon as school reopens in the fall. Returning birds of spring give ample opportunity to do flight distances and flight patterns along with late summer and fall when birds are migrating. |
| 2. Birds' Eggs | This is an excellent activity for the fall and winter months. Most of the activities can be done indoors. Doing the egg activity in the winter tends to keep the students away from the eggs found in spring nests. |
| 3. Birds' Nests | The late fall and early winter are excellent times to carry out this activity. Foliage is off the trees and nests are readily seen. |
| 4. Dead Birds | This chapter is best done in summer or early fall. |

The chapters in *Birds* may be done in any order. They are not sequential and can stand alone as separate units. However, choose chapters which tend to suit the seasonal conditions of your own area best.

Refer to the heading SKILLS AND TECHNIQUES and EQUIPMENT AND MATERIALS for each activity. The skills and techniques should be taught at the time when the student needs them or has an interest in them. If you feel there is enough interest in an activity and that enough equipment can be obtained, then organize a lesson or series of lessons based on that activity. If it is impractical to carry out a particular activity, perhaps a variation can be substituted. The lessons should primarily be of the skill-forming type and not the general knowledge type. General knowledge about the activities should come at the end, not the beginning. Once the skills have been mastered, the students can be encouraged to employ them to find out more about what interests them.

Guiding Student Inquiry

Some of the photographs in the student's text show boys and girls doing investigations. These photographs illustrate techniques that might be difficult to understand. The captions usually provide questions that guide the students to interpret the main ideas and draw attention to subtleties of technique. Other photographs illustrate phenomena related to problems that the students will be investigating.

Before attempting each activity, you might direct your students to read the captions carefully. By discussing the photographs and captions in small groups or as a class, your students can gain insight to the content of the chapter. Hopefully, some photographs will stimulate questions that will lead to activities that the students themselves devise and conduct. When this happens, your students have progressed to the threshold of open-ended inquiry, the most desirable type of learning experience. The quality of these open-ended investigations will depend on the skills developed from more directed activities and on your ability to provide guidance at critical times.

Diagrams, charts, graphs, and drawings are included to guide the students in conducting their activities or to help them in recording their data. Encourage the students to use these aids. The cartoons provide enjoyment by presenting related concepts in a humorous way. Discussion of these illustrations by students in small groups can help clarify the ideas presented in the activities.

To organize your classroom, you might set up several learning stations with different activities from the same chapter. The equipment and materials necessary for each activity should be readily available at each station or elsewhere in the classroom. The books, open at the appropriate pages, can be used as work cards. You might find it necessary to organize data-collecting sheets for the students. Some type of rotation can also be employed to take best advantage of the learning stations. For other suggestions, refer to the series overview, *Examining Your Environment, An Introduction for Teachers*, pages 31 to 37.

Since many of the activities take place outdoors, remember to inform parents and other people in the community of your plans. Be sure to obtain permission from appropriate sources and also to send out letters of thanks afterwards. These simple acts will do a great deal towards maintaining good public relations.

The sequence of steps for carrying out an activity might be:

1. The students could read the activity carefully and organize themselves to conduct the investigation from beginning to end.
2. Students could invite you to their group and outline their plans for your approval and revision, if necessary.
3. They could conduct the investigation.
4. The students could answer the *Digging Deeper* questions as well as appropriate values clarification activities suggested in this guide.
5. A reporting session can be organized so that you can gather feedback on how well the groups have progressed. The students then have a chance to report and compare their findings with other students. New avenues of investigation, as well as skill teaching and reteaching, can grow out of this reporting session.

Once the students have completed the initial investigations as a class endeavor, you might invite them to pursue new investigations. For this, you could organize the students into groups. Each group could leaf through the activities in the rest of the chapter and decide which one they wish to pursue. It will be interesting for you to see how the students make this decision. There may be implications for teaching some group interaction processes. (See *Examining Your Environment, An Introduction for Teachers* for more information on this aspect of teaching.)

Capitalize on students' questions arising out of the activity that has just been completed and guide the students to devise their own activities to answer their questions. The students will require a great deal of help when they first attempt to organize their own investigations. Try to be patient and helpful, but hold them accountable for the skills that they have just learned.

How to Use this Guide

Each teacher's guide corresponds to a book in the *Examining Your Environment* series. Every activity is analysed under several headings. When using the guidebooks, you should first read the activity in the text, as this background is needed to understand the references under some headings.

TIME

The estimated time needed to complete the activity under normal circumstances is stated under this heading.

SEASON

Under this heading, the most suitable seasons for carrying out the activity are considered. Whether the activity is to take place indoors or outdoors is also indicated.

CLASS ORGANIZATION

Here hints are given as to the ideal number of students that could perform an activity. This does not mean that more than one group could not try the same activity, if this is practical. Some activities are recommended for the whole class; other activities for smaller groups.

EQUIPMENT AND MATERIALS

Listed here are the items that will be required for each group to carry out the activity.

SKILLS AND TECHNIQUES

This column lists the main skills and techniques a student will need to carry out an activity. These items should form the instructional objectives for the activity and be the criteria for most of the evaluation to follow. The information under this heading provides insight to items that may require preteaching or review.

CONCEPTS

As a result of completing the activities, the child should have gained some general knowledge. Only the major concepts have been listed. Often they have been expressed in general terms and may be oversimplified.

SUGGESTIONS FOR VALUE TEACHING

Under this heading you will find value learning statements or questions that you could use to guide the students to determine what the activity means to them. Of course, you will, no doubt, have your own original ideas as to the type of exercises that will encourage your students to gain greater meaning from their studies and you should use your thoughts to augment the suggested ones. See the section on *Value Learning and Clarifying Values* in *E.Y.E., An Introduction for Teachers*.

CLUES TO QUESTIONS

Because the answers often relate directly to the data collected, many of the answers to the questions in the *Digging Deeper* sections will depend upon the circumstances. Some of the factors that might be considered in answering a question have been listed.

TROUBLE SHOOTING

Under this heading is a checklist of items that could help to account for the success or failure of an activity.

VOCABULARY

Under this heading you will find words the students should be able to add to their vocabularies after completing the activity.

RESOURCES

Both the text and the bibliography contain suggestions for obtaining special materials when they are required. Under this heading are listed *other* possible sources of ideas and supplies.

CROSS REFERENCES

Reference is made to a particular book when a required skill has been more fully developed in that book or when the same apparatus can be used in another activity in the book mentioned.

1. LIVE BIRDS

Activity 1:

What enables birds and airplanes to fly?

TIME

one 45-minute period

SEASON

anytime indoors
(preferably spring or fall to match other activities)

CLASS ORGANIZATION

groups of two or three

EQUIPMENT AND MATERIALS

For each group:

1 sheet of blank paper
8 straws
2 empty pop cans
1 spool of thread
1 piece of cardboard 7.5 cm x 7.5 cm
1 pencil

CONCEPTS

A high pressure area will always tend to move towards a low pressure area in order to equalize pressure or establish a balance. In weather conditions, when a high pressure and low pressure area meet, a wind will blow from the high to the low. In the case of birds and airplanes, the high pressure area is formed underneath the wing and the low pressure area above it.

The tendency of high moving to low applies a force to the bottom of the wing. This force is called *lift*.

CLUES TO QUESTIONS

The bird is a snowy owl.

The paper lifts up when air is blown across it because a low pressure area is created above the paper, thus the high pressure area below the paper pushes the paper upwards or lifts it. Air, when blown through the tentlike paper structure, will cause it to be pushed down (low pressure inside, high pressure outside).

Two cans will move towards each other since blowing between them causes a low pressure area. The high pressure area on the outside of the cans pushes them together.

Blowing through the spool of thread causes a low pressure area above the cardboard. The high pressure below the cardboard holds it up.

Some other factors contributing to a bird's ability to fly are the surface area of the wings and the bird's mass.

TROUBLE SHOOTING

- Difficulties may arise with younger students who blow too hard or not hard enough.

- Have the students perform all the activities before attempting to answer the questions or explain the diagram of the wing on page 2.

VOCABULARY

air pressure
lift
tern
experiment
aerodynamics

RESOURCES

Obtain some books on air pressure from your local library.

Ask your local high school physics teacher about some simple experiments that can be done to demonstrate the force air pressure exerts on objects.

Activity 2:

How can the fright distance of a bird be measured?

TIME

This could be done over several days on the students' own time.

Allow about 15 to 20 minutes to teach the technique and give directions for recording data.

SEASON

spring, summer or fall

CLASS ORGANIZATION

groups of two or three outside

EQUIPMENT AND MATERIALS

For each group:

1 piece of white cloth
1 tape measure
1 pencil
1 clipboard
1 piece of paper with chart drawn on it

SKILLS AND TECHNIQUES

- ability to use a large measuring tape

CONCEPTS

Different birds have different fright distances. That is, some birds will allow you to get very close to them while other birds take flight while you are still a great distance away from them.

SUGGESTIONS FOR VALUE TEACHING

Consider the following situation and circle your position on the value line.

Wicked Wilfred
throws things
at birds, takes
eggs from nests
and destroys
nests.

Timid Tim is
afraid to go
near nests. He
does not dis-
turb the eggs
or the nest.



CLUES TO QUESTIONS

Answers to the questions here will depend solely upon the information gathered by the students.

TROUBLE SHOOTING

- Difficulties arise in the students' ability to identify the birds they see. This is an ideal point to introduce bird identification books. If the students are unable to identify the birds by name, have them assign a letter or number to the birds instead.

- Always have the students measure the linear distance on the ground.

VOCABULARY

timid	average
mental	species
calculate	

RESOURCES

Find out if there are any local bird watchers in your area. They are invaluable people for aiding the students in their bird identification.

Activity 3:

What are the flight patterns of the birds in your area?

TIME

This could be done during and after school hours by the students.

Allow a 15 to 20-minute session for giving the students a frame of reference about the types of flight patterns.

SEASON

anytime

CLASS ORGANIZATION

groups of two or individually

EQUIPMENT AND MATERIALS

For each group:

- 1 clipboard
- 1 pencil
- several blank sheets of paper
- 1 field guide to birds if one is available

* SKILLS AND TECHNIQUES

- observing flying birds to detect flight patterns
- expressing the flight patterns, verbally and pictorially as outlined on pages 6 and 7

CONCEPTS

Different birds have different flight patterns.

Birds of the same species have similar flight patterns.

A bird's structure affects its flight pattern.

The type of food a bird eats affects its flight patterns, e.g., birds of prey have flight patterns quite different from waterfowl.

SUGGESTIONS FOR VALUE TEACHING

Discuss the effect on the "fright distance" of birds of feeding them regularly at a feeding station. What might happen if a bird that had learned to trust people met Wicked Wilfred?

CLUES TO QUESTIONS

The structure of a bird definitely affects flight patterns. In particular the wing size affects the pattern.

TROUBLE SHOOTING

- Students usually have trouble expressing flight patterns verbally unless the teacher has given them ample experience in the classroom and while they are actually watching birds fly.

● Students have difficulty identifying the birds they see. The bird guide mentioned on page 7 is excellent.

VOCABULARY

hover
glide
descriptive
mural
minimum
sail
fluttery

Branching Out:

TIME

two 45-minute periods:
 one for observing
 one for recording

SEASON

anytime

CLASS ORGANIZATION

entire class or small groups of interested students

EQUIPMENT AND MATERIALS

For each group:
drawing materials
stopwatch
library research materials

* SKILLS AND TECHNIQUES

- describing the wing beat of birds verbally
- drawing illustrations of wing beats
- timing flight speed with a stopwatch

CONCEPTS

Each bird species has a different wing beat, speed, and flight pattern. Velocity, or speed, equals distance divided by time.

CLUES TO QUESTIONS

When gliding or sailing, a bird holds its wings curved downward.

TROUBLE SHOOTING

● Some students may have difficulty in understanding how wing beats differ. If reinforcement in the classroom is needed, certain wing beats can be simulated using a long strip of paper

attached at the center to a pencil. Arm movements are also helpful.

● Timing the speed of different birds may prove difficult. Many variables are involved and students may not always be able to make fair comparisons. However, the students should be able to appreciate that different birds fly at different speeds.

● If general articles on birds do not provide sufficient information on flightless birds, specific articles may be consulted, e.g., dodo, ostrich, kiwi, etc.

VOCABULARY

<i>jerky</i>	<i>zigzagging</i>
<i>bouncy</i>	<i>rapid</i>
<i>darting</i>	<i>deep</i>
<i>circling</i>	<i>shallow</i>
<i>bounding</i>	<i>fluttery</i>
<i>erratic</i>	<i>hovering</i>
<i>twinkling</i>	<i>mechanical</i>
<i>irregular</i>	<i>wavering</i>
<i>swooping</i>	<i>velocity</i>
<i>unsteady</i>	<i>factors</i>
<i>soaring</i>	

CROSS REFERENCES

Ecology in Your Community, page 58.

Activity 4:

What is in a box of birdseed?

TIME

two 45-minute periods

SEASON

anytime indoors

CLASS ORGANIZATION

groups of two or four

EQUIPMENT AND MATERIALS

- 1 box or bag of mixed birdseed (commercially prepared)
- 1 strip of white paper for gluing seed onto for the graph
- 1 large piece of Bristol board or construction paper
- 1 piece of blank paper for the white paper report on the graph

SKILLS AND TECHNIQUES

- classifying accurately, based on simple bulk properties, such as size, shape, color, etc.

- constructing, reading, and interpreting a bar graph with a white paper

- understanding that a white paper should explain what the graph is about and that it should list at least three questions for others to answer from the graph

CONCEPTS

All bar graphs start from a zero base line.

Bar graphs are only linear comparisons. There should be a minimum of three titles, one for each of the axes and a main title which tells what the graph is about.

All graphs should be accompanied by a white paper which explains the graph and asks questions to draw the observer's attention to the data contained in the graph.

Some birds eat a variety of seeds and have beaks adapted for this.

Some birds eat insects and other animals. Their beaks are adapted for this. (See chart on page 11.)

SUGGESTIONS FOR VALUE TEACHING

Discuss the value of feeding birds in your area or consider the following situation and circle your position on the value line.

John sets a bird feeder up in late August and keeps it going until January, then he stops.

Paul starts a bird feeder early in the spring and maintains it all year round.



CLUES TO QUESTIONS

Seed eaters have short, stout bills for cracking birdseed.

Meat eaters have hooked beaks for tearing their meat.

Birds must swallow their food whole since they have no teeth for chewing.

A variety of seeds is usually provided in commercially prepared birdseed to accommodate different food preferences and to provide a more balanced diet.

TROUBLE SHOOTING

- When working with the boxes of seeds use flat tables whenever possible since spillage is common.

- Watch that the students do not take too great a quantity of seeds to classify. Usually a large tablespoon placed on a piece of white paper in front of them is sufficient.

VOCABULARY

<i>fabulous</i>	<i>graph</i>
<i>energy</i>	<i>compile</i>

RESOURCES

Write the manufacturer of the birdseed or your local agricultural representative for aid in identifying the various kinds of seeds.

Activity 5:

What type of bird feeders can be built for birds?

TIME

several 45-minute periods

SEASON

Preferably in the early fall season since any type of bird feeder must be well established before birds begin to migrate southward.

CLASS ORGANIZATION

groups of two

EQUIPMENT AND MATERIALS

Since there is such a variety of bird feeders a central supply of materials should be amassed so that each group can select from it.

1 box 3 cm finishing nails

1 box 3.5 cm finishing nails

1 ball of string

1 electric or hand drill

several hammers

a variety of scrap wood 1.5 cm to 2 cm thick

several handsaws

hardware cloth 1 m²

variety of old paints (preferably enamel)

SKILLS AND TECHNIQUES

- using a hammer
- using a handsaw
- using an electric drill
- following directions and reading and/or drawing simple plans
- using a measuring stick or tape

CONCEPTS

Birds require tremendous amounts of food to supply the energy required for flying. Only certain birds will come and eat at certain types of feeders. Bird feeders should be started in late summer or early fall if they are to be continued through the winter. Birds like a variety of foods. There are a great variety of bird feeders.

SUGGESTIONS FOR VALUE TEACHING

Use this activity to have the students note the value of constructive criticism and how we help one another by working together.

CLUES TO QUESTIONS

The types of questions asked in this activity can only be answered from first-hand observation of the birds in your area. If the students cannot identify the birds have them assign a number or letter to a particular species.

TROUBLE SHOOTING

- There should be a variety of bird books available for identification.
- There should be actual models of the different types of feeders for the students to handle, measure and get patterns from.
- There should be a great variety of scrap wood and finishing nails on hand.

VOCABULARY

*dependent
binoculars
suet
pulleys
platform
rotating*

RESOURCES

Local lumberyards and/or industrial arts rooms in schools may be able to supply you with both materials and the wood.

CROSS REFERENCES

See *Birds*, pages 50 and 51, for bird-houses.

Activity 6:

How can birds be identified?

TIME

1 hour

SEASON

spring, summer or fall

CLASS ORGANIZATION

whole class together

EQUIPMENT AND MATERIALS

For each group:

- 1 field guidebook of same format per four students
- a variety of "field checklists" on birds from local science museum if possible
- a large chart illustrating the parts of a bird if possible

SKILLS AND TECHNIQUES

- knowing the parts of a bird identification book
- understanding the format of the book
- recording field markings of birds via simple diagrams and point-form notes
- recognizing distinctive markings on the birds sighted
- observing
- classifying

CONCEPTS

All birds have similar body parts as outlined in the diagram on page 17. All bird identification books have a distinctive and similar format. Once that format is learned it will greatly aid in bird identification. All birds are classified into groups. A bird's habitat is a good clue towards its identification. Different species of birds have similar field markings. Young, immature birds have different markings than their parents or the adult bird. The size, shape, field markings, actions, song, and habitat of a bird all aid in its identification.

SUGGESTIONS FOR VALUE TEACHING

An opportunity to stress group work and division of labor. Each student or group of students could be responsible for some aspect of the identification, for example:

Fred's group, the nest

John's group, the song

Ann's group, the field markings.

Later the students can work as a team to compare their records and discuss them.

CLUES TO QUESTIONS

A good bird identification book such as *A Field Guide to the Birds* by R.T. Peterson, will outline the different families of birds for you. There are approximately 20 different families of birds. The book will guide a beginner through Use of the Book, Illustrations, Area, Range, Subspecies, Descriptions, and Techniques.

It is not uncommon to find a bird identification book listing over 36 separate terms in describing the parts of a bird's body.

The symbols indicate male or female birds.

TROUBLE SHOOTING

- Usually there are not enough bird identification books to go around. They must be ordered or borrowed -- one to four students is not a bad ratio.

Local libraries and bird-watching clubs should have some on hand.

- Terminology tends to be too difficult for most elementary students. Concentrate on the broader aspects of field markings.

VOCABULARY

<i>terminology</i>	<i>habitat</i>
<i>rump</i>	<i>anatomy</i>
<i>crown</i>	<i>field-marks</i>
<i>palmate</i>	<i>crest</i>
<i>semipalmate</i>	

RESOURCES

Local science museums maintain a collection of all the birds of your area.

Usually science museums will put on a special identification class for students using stuffed birds as concrete material.

A science museum can also put you in touch with local ornithological clubs and resource people.

CROSS REFERENCES

See chart on page 63 regarding bird features.

Activity 7:

How can a plaster cast of a bird's foot-prints be made?

TIME

several 45-minute periods

SEASON

spring, summer or fall

CLASS ORGANIZATION

groups of two

EQUIPMENT AND MATERIALS

For each group:

2 Styrofoam coffee cups

250 g of plaster of Paris

several paper clips

(2 for each case to be made)

several stir sticks

25 g of salt

several strips of cardboard 2.5 cm x 20 cm

1 large bottle of shellac for class

a variety of enamel paints

a variety of paint brushes

a box of borax

hot plate

pot for boiling water

* SKILLS AND TECHNIQUES

- using plaster of Paris to make casts

- making plaster casts into plaques by painting and shellacking

CLUES TO QUESTIONS

Salt will make the plaster set faster.

Placing the cast in boiling water to which borax has been added will help to harden the cast.

Squares of cardboard or irregular shapes can be used to mold the plaster.

CONCEPTS

Birds have developed great differences in the shape of their feet.

A bird's foot has toes.

Birds usually have one well-developed toe that points backwards in order to give the bird balance.

The toes of birds correspond to the type of food they eat and their habitat.

SUGGESTIONS FOR VALUE TEACHING

Consider the following situation and circle your position on the value line.

Ruthless Ron grabs chicks and squeezes them. He paints their feet with ink rather than washable tempera paint.

Fraidy-Cat Fred is too scared to touch chicks.



TROUBLE SHOOTING

- For obvious reasons the teacher should boil water for students.
- Students should select only the clearest prints.
- Students tend to use more plaster than they need.
- Use only enough to fill the circular collar of cardboard. Have them make a collar and measure out in tablespoons the quantity of plaster to fill it nearly to the top.
- Students often use too much salt and the mixture hardens before they can get it out of the container.
- Students tend to want to remove the cast before it has hardened sufficiently.

VOCABULARY

borax

plaque

solution

shellac

RESOURCES

Local hardware stores will supply most of your needs.

Branching Out:

TIME

several 45-minute periods

SEASON

anytime

CLASS ORGANIZATION

small groups of interested students

EQUIPMENT AND MATERIALS

For each group:
materials for making plaster casts as in previous activity

live bird(s) for studying
water and appropriate bird food
writing materials
graph paper
tempera paint
mural or poster paper

SKILLS AND TECHNIQUES

- making plaster casts
- observing and recording mass changes
- comparing bird tracks with those of other animals
- observing and comparing the features of different birds

CONCEPTS

When placed on their back, most birds do not move, but lie motionless for a time.
All birds do not have the same angle of vision.

SUGGESTIONS FOR VALUE TEACHING

How would your life be different if there were no birds? Do you think bird sanctuaries serve a useful purpose? Why?

CLUES TO QUESTIONS

When lying on their back, most birds are confused at first, since this position is totally strange to them.
Owls have stereoscopic vision since their eyes are located at the front of the head.
Other birds have singular vision since their eyes are located at the sides of the head.

TROUBLE SHOOTING

- Baby chicks may prove to be the easiest birds to handle. Tame pigeons are also quite docile.
- Changes in the bird's mass will depend on whether it is a young, growing bird or an adult.

VOCABULARY

bird sanctuary

aviary

RESOURCES

Local hatcheries may provide baby chicks for observation.

CROSS REFERENCES

Ecology in Your Community, page 84 (marshland protection).

2. BIRDS' EGGS

Activity 1:

What are the parts of a chicken's egg?

TIME

45 minutes

SEASON

anytime

CLASS ORGANIZATION

groups of two or four

EQUIPMENT AND MATERIALS

For each group:

6 chicken's eggs (more if possible)
several pieces of window glass
several pieces of black construction paper
water and pan for boiling eggs
microscope (100x)
duck's eggs

SKILLS AND TECHNIQUES

- cracking open an egg without breaking the yolk
- recording information by means of a labelled diagram

CONCEPTS

The chicken's egg has six main areas beginning from the outside and going to the center (see chart of "Structure of a Chicken's Egg" page 25).
All birds' eggs have a similar structure.
All birds lay eggs.
A fertilized egg has the potential of reproducing a bird similar to its parents.
A fertilized bird's egg is a living thing.

SUGGESTIONS FOR VALUE TEACHING

Discuss the values of having laws and regulations relating to migratory birds.

CLUES TO QUESTIONS

Chicken's eggs contain a clear liquid substance, a whitish structure and a yellow yolk.

There are two white stringlike structures attached to opposite sides of the yolk. They keep it balanced and upright. The white spot on the yolk is the germinal disc. When fertilized it becomes the embryo.

The yellow part of the egg is enclosed by albumen which is rich in protein. The yellow yolk is different shades of yellow. It contains food nutrients. Pigmentation in the shells of some eggs camouflages them from predators. It is an adaptation to the environment. CaCO_3 is the chemical formula for calcium carbonate, the main component of eggshells. Membrane and shell are porous to gases such as air. The yolks of eggs vary in color. Some are even bright red. Different eggshells have varying textures.

TROUBLE SHOOTING

- Be sure the surface the egg is on is flat, otherwise it usually ends up in the lap of the observer or on the floor.
- Eggs may be hard boiled in advance and brought to class.

VOCABULARY

<i>oology</i>	<i>calcium carbonate</i>
<i>altricial</i>	<i>clutch</i>
<i>precocial</i>	<i>edible</i>
<i>albumen</i>	<i>palatability</i>
<i>membrane</i>	<i>texture</i>
<i>germinal disc</i>	<i>incubation</i>
<i>chalaza</i>	<i>hatch</i>

RESOURCES

Local chicken hatcheries could supply resource people and literature. Local agricultural colleges and their departments of poultry science are invaluable aids.

CROSS REFERENCES

See variety of eggs on page 31.
See pages 37 to 39.
Camouflage by pigmentation (killdeer eggs): *Ecology in Your Community*, page 63.

Activity 2:
What measurements of a chicken's egg
can be taken?

TIME
45 minutes

SEASON
anytime

CLASS ORGANIZATION
groups of two

EQUIPMENT AND MATERIALS
For each group:
6 of each grade of eggs (small, medium
and large)
calipers
a balance
string
ruler (marked in millimetres)

SKILLS AND TECHNIQUES

- reading tape measures
- reading calipers
- finding the mass of objects
- recording data in chart form
- finding average measurements

CONCEPTS
Eggs come in a great variety of shapes
and sizes.
Chickens' eggs are classified into
three groups: small, medium and large.
A dozen large eggs have a mass of 680 g
or more, medium 625-680 g, small
570-625 g.
When birds' eggs are classified and
identified by scientists, color and
length are the two most important prop-
erties described.
Canada was the first country in the
world to have a system of egg grading.

SUGGESTIONS FOR VALUE TEACHING
*Put on a display of Easter eggs
decorated by Ukrainian people of your
area. Discuss the actual painting and
the beauty of the finished eggs.*

CLUES TO QUESTIONS
The term Grade A Large is determined by
four considerations: quality as deter-
mined by candling, mass, cleanliness
and quality of the shell construction.

A dozen Grade A Large must weigh 680 g
or more.
Hummingbirds lay the smallest eggs,
barely 5 mm long. Ostriches lay the
largest, about 180 mm long.

TROUBLE SHOOTING

- Students may have to be taught how
to measure in millimetres.
- Students will have to be instructed
in the use of calipers. If calipers are
not available, place the egg between two
books pushed together until they just
touch the egg, then measure the distance
between the books in millimetres.

VOCABULARY

calipers	average
millimetres	ornithologist
medium	circumference

RESOURCES
Local science museums have large col-
lections of birds' eggs.

CROSS REFERENCES
See chart on page 31.

Activity 3:
How can eggs be classified according to
shape?

TIME
45 minutes

SEASON
anytime

CLASS ORGANIZATION
groups of two or four

EQUIPMENT AND MATERIALS
For each group:
several real bird's eggs if possible
several copies of the charts found on
pages 30 and 31

SKILLS AND TECHNIQUES

- classifying according to shape
- classifying according to other
bulk properties such as size and color
- classifying according to texture

CONCEPTS

There are four basic classifications of egg shapes.

The four shapes are spherical-elliptical, subelliptical, oval and pyriform.

Under each of the four basic classifications there are three subclassifications. (See chart page 30.)

Scientists believe that the "egg-shaped" structure is a protective feature because it allows heat to be more evenly distributed, gives strength and prevents the eggs from rolling in a straight line.

SUGGESTIONS FOR VALUE TEACHING

What value would a long pyriform egg be to a bird that builds its nest on high rocky ledges?

CLUES TO QUESTIONS

A chicken's egg is subelliptical.

Eggs do have built-in safety factors, as mentioned above.

The most common shape seems to be the subelliptical classification.

The least common shape is the pyriform.

The short pyriform rolls in a very tight circle.

TROUBLE SHOOTING

- Make sure the students realize that eggs can be classified according to more than just the one bulk property of shape. Color, size, mass, texture, and length are also used in classifying eggs.

- Canada's Migratory Bird Regulations forbid the disturbing of certain birds' nests. Make sure any real eggs are from acceptable sources.

VOCABULARY

<i>classification</i>	<i>oval</i>
<i>spherical-elliptical</i>	<i>subelliptical</i>
<i>pyriform</i>	

RESOURCES

Local science museums.

CROSS REFERENCES

See pictures on pages 24 and 29.

Activity 4:

Under what conditions will a thrown egg break?

TIME

1 hour

SEASON

spring, summer or fall

CLASS ORGANIZATION

groups of four

EQUIPMENT AND MATERIALS

several dozen eggs

SKILLS AND TECHNIQUES

- controlling variables
- recording information in chart form

CONCEPTS

Eggs have great strength along their long axis. If an egg lands on this axis little or no damage will result.

The short axis is very weak and vulnerable to damage. When pressure is put on the short axis it is not distributed evenly and breakage usually results.

When pressure is applied to the long axis it is distributed more evenly over the entire egg.

The harder the surface an egg falls on, the more likely it is to break.

CLUES TO QUESTIONS

The greater the angle at which an egg is thrown onto a surface, the more likely the egg is to break.

The spherical shape of eggs helps to distribute pressure evenly over the egg thus causing less breakage.

The taller the grass, the fewer the breakages.

TROUBLE SHOOTING

- Students will tend to use too many eggs unless strict procedures and limits are placed on the activity.

- Students should decide beforehand which variables will be changed and which will be held constant. They should be doing a treatment experiment.

- Arrangements should be made for cleaning up any debris.

VOCABULARY

<i>variable</i>	<i>arc</i>
<i>force</i>	<i>ancestor</i>
<i>angle</i>	<i>factor</i>

CROSS REFERENCES

See *E.Y.E., An Introduction for Teachers*, pages 56 to 58 for information on controlling variables and the treatment experiment.

Activity 5(a):

How can a styrofoam (polystyrene) pop cooler incubator be constructed?

TIME

several 45-minute periods

SEASON

anytime

CLASS ORGANIZATION

entire class or groups of four (depending on the number of incubators to be built)

EQUIPMENT AND MATERIALS

For each group:

- 1 thermostat
- 1 pigtail socket
- 1 40 or 60 W light bulb
- 1 2 m piece of lamp cord
- 3 marrettes
- 1 male plug
- 1 polystyrene pop cooler
- 1 wall type thermometer
- 1 piece of hardware cloth 30 cm x 60 cm
- 1 roll of wide masking tape
- 1 window glass 15 cm x 25 cm
- 3 corks 25 mm in diameter
- 1 piece of burlap or cloth to cover the hardware cloth
- 1 sharp knife
- 1 pencil
- 1 stir stick
- 1 screwdriver
- 1 pair wire cutters
- 1 pair tin snips

SKILLS AND TECHNIQUES

- candling eggs
- reading a thermometer scale
- recording data on a chart
- making equipment by following a plan
- controlling variables in a given environment

CONCEPTS

An incubator can be used to hatch eggs. Critical factors in hatching eggs are time, temperature, and humidity. 37°C is the ideal temperature for incubating chicken eggs. Eggs must be fertilized in order to develop. Chicken eggs take approximately three weeks to develop. Other fowl eggs differ in the time required to hatch them.

SUGGESTIONS FOR VALUE TEACHING

(a) List several reasons why infants need so much care.

Of what value is man's ability to simulate nature? Example: incubator for babies.

TROUBLE SHOOTING

- The biggest problem the students will encounter in construction of the incubator is the wiring. This should be done along with the students by an adult. Have a local maintenance person, electrician or shop teacher check it out.
- Be sure to control the humidity in the incubator. Check the end of the egg for the size of the air space. If it increases in size provide more moisture.

VOCABULARY

<i>polystyrene</i>	<i>humidity</i>
<i>incubator</i>	<i>fertilized</i>
<i>regulate</i>	<i>candling</i>

RESOURCES

Local hatcheries, colleges of agriculture, farms, science supply houses, Departments of Agriculture, and Ministries of Natural Resources.

Activity 5(b):

How can an egg candler be constructed?

TIME

1 hour

SEASON

anytime

CLASS ORGANIZATION

entire class or groups of four
(depending on number of candlers
required)

EQUIPMENT AND MATERIALS

For each group:

1 #5 juice can or coffee can

1 2 m extension cord

1 60 W light bulb

1 pair of tin snips

1 spring clothes-peg

OR:

1 slide projector

SKILLS AND TECHNIQUES

- candling eggs
- recognizing correct air space for
number of days of incubation (see chart
page 36)
- recognizing fertile, infertile,
and stale eggs (see chart page 37)

CONCEPTS

Chicken's eggs take 21 days to develop.
At certain stages distinct body struc-
tures can be seen (see chart page 38).
Eggs can be fertile, infertile or stale.
When candled, fertile eggs show a dark
spot surrounded by a net of tiny blood
vessels. The dark spot is the living
embryo.

A candler simply produces a beam of light
that is intense enough to pass through
the egg.

SUGGESTIONS FOR VALUE TEACHING

*If there were no candling regula-
tions for the eggs that people buy,
what could happen?*

CLUES TO QUESTIONS

The size of the air spaces can be regu-
lated by increasing or decreasing the
amount of moisture.

The eggs need only be candled once around
the seventh day to determine which eggs
should stay and which should be removed.
Candling could occur once more for a
check around the twelfth to fourteenth
day.

TROUBLE SHOOTING

●When eggs are being candled and/or
turned do not let them get too chilled.
Work quickly and methodically to avoid
any damage.

●When candling the eggs work in a
darkened area and hold the eggs right
up to the light source.

●Dark-shelled eggs should be candled
around the seventh or eighth day while
white-shelled ones could be done as
early as the fourth or fifth day.

●Eggs lacking a dark spot or with a
very irregular blood vessel pattern
should be removed from the incubator.

VOCABULARY

blood vessels

infertile

embryo

stale

fertile

RESOURCES

Local Departments of Agriculture or
agricultural colleges have charts out-
lining the development of the chicken
embryo.

Branching Out:

Breaking Open Some Eggs

TIME

several 45-minute periods

SEASON

anytime indoors

CLASS ORGANIZATION

small groups of interested students

EQUIPMENT AND MATERIALS

For each group:

incubator
Saran Wrap
adhesive tape
taped razor blade
pencil
water
salt
bowl
hand lens
refrigerator or freezer
candle wax
phonograph turntable
strong magnet
a balance

SKILLS AND TECHNIQUES

- following directions
- observing the effect of different conditions upon incubation

CONCEPTS

proper hatching will not occur unless certain incubation conditions are met. Some factors that affect embryo development are: temperature, humidity and egg movement. Experiments must be carried out using proper controls and changing only one variable each time.

CLUES TO QUESTIONS

Results of some of the experimenting will depend on students' observations. A wax coating prevents moisture from entering or leaving the egg and prevents hatching from taking place. Low humidity will kill nearly all chicks or cause them to be badly deformed. If the eggs are not rotated, the likelihood of death or deformity is increased.

VOCABULARY

<i>blood circulation</i>	<i>mortality</i>
<i>fertile</i>	<i>controls</i>
<i>solution</i>	<i>environmental</i>
<i>embryonic</i>	<i>reliable</i>

3. BIRDS' NESTS

Activity 1:

Do birds build their nests on any particular side of a tree?

TIME

It will take some time to collect the data required for this activity. It should be done over several weeks with at least 30 to 50 nests being surveyed. The initial introductory lesson should take about 45 to 60 minutes.

SEASON

preferably fall through late spring

CLASS ORGANIZATION

groups of two

EQUIPMENT AND MATERIALS

For each group:

graph paper
chart paper
magnetic compass (if possible)
hypsometer (if possible)
clinometer (if possible)

SKILLS AND TECHNIQUES

- drawing angles with a protractor
- reading a magnetic compass
- constructing, reading and interpreting a graph
- estimating in percentages
- recording data in chart form
- calculating averages
- reading a hypsometer scale
- reading a clinometer

CONCEPTS

Certain birds do nest on a particular side of a tree.

Nest type, amount of sun, and prevailing winds seem to be the main factors influencing nest location.

SUGGESTIONS FOR VALUE TEACHING

List five ways research helps man.

CLUES TO QUESTIONS

Most hanging or pensile nests tend to be located on leeward sides of trees.

Many nests tend to be found near the center of trees or where the thickest foliage prevails.

Some species of birds always build their nests within a given height or range above the ground while others such as the robin do not. Some birds always nest above 15 m.

TROUBLE SHOOTING

- Have students check the prevailing wind direction as well as compass directions.
- Make sure enough nests are surveyed.
- If this activity is done in late spring the students may tend to disturb nesting birds.

VOCABULARY

compass	saddled
survey	cupped
pensile	prevailing
semipensile	clinometer
platform	hypsometer

RESOURCES

Local ornithologists and their clubs.

CROSS REFERENCES

See pages 42, 43 and 52 to 57.

Activity 2:

In how many ways can a bird's nest be measured?

TIME

90 minutes

SEASON

fall

CLASS ORGANIZATION

groups of two

EQUIPMENT AND MATERIALS

For each group:

ruler
measuring tape
1 ball of string
calipers
scales
chart paper

SKILLS AND TECHNIQUES

- reading calipers
- using balance scales
- measuring circumference and diameter
- measuring with rulers or tapes
- recording data in chart form

CONCEPTS

Nests are designed and built primarily for raising young birds.

Each species of bird builds a different kind of nest according to instinct and habitat.

SUGGESTIONS FOR VALUE TEACHING

Discuss the following question: Do homes for animals and people provide the same kinds of things?

CLUES TO QUESTIONS

Nests have a great variety in their measurements. The circumference of a circular nest is approximately two and a half times its diameter.

There is a wide variation in inside nest diameters. The inside diameter is very important to the bird and to the nidologist attempting to identify it.

TROUBLE SHOOTING

- Either string and rulers or measuring tape may be used to find circumference.
- Students will need special instructions if calipers are used. Both inside and outside diameters should be measured.
- Nests brought into the classroom for the activities should be sealed up in plastic bags since most contain a great number of small creatures.

VOCABULARY

nidology *variation*
diameter *species*
circumference *habitat*
nest cup

RESOURCES

Local science museum for aid in identifying and displaying.

CROSS REFERENCES

See pages 52 to 57.

Activity 3:

What materials are found in a bird's nest?

TIME

90 minutes

SEASON

spring for the nest material board
fall or winter for the classifying activity

CLASS ORGANIZATION

groups of two

EQUIPMENT AND MATERIALS

For each group:

newspapers
bird's nest
piece of pegboard 30 cm x 30 cm
variety of cloths, threads, string, wool, etc.

SKILLS AND TECHNIQUES

● classifying, labelling, and displaying items properly

CONCEPTS

Different birds use a variety of materials to build nests.

CLUES TO QUESTIONS

A bird's habitat dictates the materials the nest will be made from. Almost all available materials both natural and man-made are used.

Usually the outer part of the nest is made of hard, coarse, textured materials while the inside of the nest is lined with softer materials.

Nests are built to raise the young in. Some birds do not build a nest at all.

TROUBLE SHOOTING

● When collecting nests be sure they are no longer in use.

● Have the students take apart their nests on newspapers.

● When locating a nest material board, do not place it too near the ground and place it away from all buildings.

VOCABULARY

typical *lining*
material *singly*
label *colonies*
classify

Activity 4:

How many pieces of material are used in the construction of a bird's nest?

TIME

60 to 90 minutes

SEASON

fall or winter

CLASS ORGANIZATION

groups of two

EQUIPMENT AND MATERIALS

For each group:

newspapers
bird's nest
large chart paper

SKILLS AND TECHNIQUES

- classifying
- counting
- displaying

CONCEPTS

Birds put much time and effort into their nest building. Most nests are built very well and are very sturdy. The amount of energy spent is tremendous. (The mass of most birds decreases by half overnight.) Almost every single piece of material is carried and woven separately into the nest.

SUGGESTIONS FOR VALUE TEACHING

Of all the creatures on earth man is the most intelligent. Who is more in harmony with nature, man or the animals?

CLUES TO QUESTIONS

The number of individual pieces and materials in a nest will vary greatly. There is no set number or pattern. The bird who builds the nest has to carry each piece of material separately. Materials in the nest will vary in shape, source, size, texture, length, age, and color. Nests are most often held together by the interweaving of the materials. Lighter nest materials are usually found on top or in the lining. Food source, shelter and availability of materials are some factors that determine nest location. In some cases both male and female build the nest; in other instances one or the other builds the nest.

TROUBLE SHOOTING

- When the students are taking the nests apart they must be cautioned to work slowly and carefully. They tend to hurry and break pieces of the material into several parts.

- Have the students work on newspapers.

- Stay clear of nests with mud in them for this activity.

Activity 5:

What types of birdhouses can be built?

TIME

several 45-minute periods

SEASON

late winter and early spring

CLASS ORGANIZATION

groups of two

EQUIPMENT AND MATERIALS

For each group:

large assortment of various woods from rough plank through to finished pine or spruce
finishing nails
several hammers
several saws
4 hinges
small assortment of screws
screwdriver

SKILLS AND TECHNIQUES

- following a given plan to make equipment

- using tools such as a saw, hammer, and nails

CONCEPTS

Different species of birds prefer different types of birdhouses. See chart on page 51 of the text.

SUGGESTIONS FOR VALUE TEACHING

Circle the answer you think is the best one.

A man is going to build several birdhouses. Should he

A. make all the houses with large openings?

B. make all the houses with small openings?

C. use different size holes for different types of birds?

CLUES TO QUESTIONS

Nest boxes tend to be larger and much deeper than ordinary birdhouses.

Cats, squirrels, raccoons, rodents and other birds might disturb birdhouses.

Building to proper specifications and putting proper guards below birdhouses (such as a flange) or placing the birdhouse on a tall pole will help make the birdhouse safer.

TROUBLE SHOOTING

- Students need very specific instructions and plans when doing this activity.

- Materials for each type of nest box or birdhouse should be laid out for the students in advance.

- Define limits and procedures regarding the obtaining of tools, wood, etc. should be announced first.

VOCABULARY

dimensions

nesting box

RESOURCES

Local lumberyards and local Department of Natural Resources.

Activity 6:
How can birds' nests be identified?

TIME
1 hour

SEASON
early fall or winter

CLASS ORGANIZATION
groups of two when actually using the key
one large group when explaining the key
The use of an overhead projector is invaluable for the teaching of this lesson.

EQUIPMENT AND MATERIALS
1 copy of the key for every two students
1 overhead projector
several simple nests, e.g., oriole, robin

SKILLS AND TECHNIQUES

- classifying
- reading an alternate biological key following directions

CONCEPTS
There is a great variety of bird nests.
Nests can be identified through the use of a biological key. The nests are classified according to location, materials outside and inside the nest, shape, type, and bird seen nesting there.
The only truly positive identification is to actually see the bird building it or nesting on it.
Not all nests are made by birds.

CLUES TO QUESTIONS
There is such a soup as bird's-nest soup. It is made from the nest of a bird that builds its nest in caves; usually on the walls and ceilings of the cave. The nests are pulled down with long bamboo poles. The whole nest is used.
The flavor comes from the saliva the bird uses in making the nest.

TROUBLE SHOOTING

- The key at best is very difficult to comprehend mainly because of the following: difficult vocabulary, unfamiliar names, and difficulty in following the flow of the key.
- Time must be spent reviewing the steps of the key. Start with a simple known nest (use only nests in excellent condition) and work through the key after the students have become familiar with its parts and format.
- Remind the students to be aware of nests made by animals other than birds.

VOCABULARY

<i>key</i>	<i>cottony</i>
<i>alternate</i>	<i>lichen</i>
<i>tussocks</i>	<i>rootlets</i>
<i>burrows</i>	<i>spherical</i>
<i>felted</i>	<i>semipensile</i>

RESOURCES
Local ornithologists, science museums and Department of Lands and Forests.

4. DEAD BIRDS

Activity 1:

How does a dead bird disappear?

TIME

45 minutes

SEASON

spring or summer

CLASS ORGANIZATION

entire class

EQUIPMENT AND MATERIALS

1 dead bird (at least)

chicken wire

4 stakes of wood

SKILLS AND TECHNIQUES

- recording data in a log
- listing

CONCEPTS

All birds die at some time or another, yet very few dead birds are seen lying around. When things die, small creatures, bacteria, wind and rain aid in breaking the bodies down. The animal is returned to its basic chemical elements. This is known as a decay cycle. Energy is released from the bodies of dead birds and returned to the soil.

SUGGESTIONS FOR VALUE TEACHING

If you had the money to purchase machinery to recycle only one type of material, how would you rank the following in importance in your community?

- _____ paper
- _____ garbage
- _____ glass
- _____ aluminum
- _____ steel
- _____ plastics

CLUES TO QUESTIONS

Microscopic animals and bacteria begin the decay or decomposition of the body the moment it dies. Larger animals such as flies, ants, insects, other birds, cats, etc. also play an important role. All the soft fleshy parts of the animal go first. The bones, feathers, claws and beak remain for a long time. Visible changes occur in a day or so.

TROUBLE SHOOTING

● Only freshly killed birds should be used. Children should be warned not to handle any dead animals without an adult's supervision and then only animals recently killed. Partly decomposed bodies should be left. Place the carcasses in an out of the way area, known only to you and the class. Be sure and cover the carcass with wire.

VOCABULARY

sanitation squad decay cycle
carcass deterioration

RESOURCES

Encyclopedias regarding the decay cycle.

Activity 2:

How can the parts of a dead bird be displayed?

TIME

1 hour

SEASON

spring, summer or fall

CLASS ORGANIZATION

groups of two or four

EQUIPMENT AND MATERIALS

recently killed birds, such as ducks
1 sharp knife
stiff mounting cardboard
roll of fine copper wire

SKILLS AND TECHNIQUES

- displaying
- using a sharp knife or small saw

CONCEPTS

Birds have a variety of different feet and wing shapes. Although shape and size may vary in the wings the types of feathers do not. All wings have primary and secondary flight feathers.

SUGGESTIONS FOR VALUE TEACHING

Of what value to the community are museums?

CLUES TO QUESTIONS

Long, narrow wings allow the bird to soar and glide.
Wing feathers are usually strong, firm, and larger than any other feathers found on the bird's body.
The feathers are attached directly into the skin of the bird. They grow from specialized cells within the skin.
A bird's habitat and food sources can often be found out from the structure of its legs and feet. (See chart and legend on page 63.)

TROUBLE SHOOTING

● An adult should supervise any cutting up of a dead bird. Local high school teachers or local taxidermists can serve as resource people.

VOCABULARY

webbed
structure

RESOURCES

Local taxidermists, high school biology teacher or local Department of Lands and Forests.

Activity 3:

How can the skeleton of a bird be made?

TIME

two or three 90-minute periods

SEASON

anytime

CLASS ORGANIZATION

entire class

EQUIPMENT AND MATERIALS

- 1 chicken (preferably large and old)
- 1 pot
- water
- several sharp instruments for cleaning the bones
- newspapers
- paper towels
- 1 hot plate or a stove
- glue
- block of wood
- copper wire
- 2 wooden dowels (if standard mount is to be done)
- 1 large sheet heavy stiff cardboard

CONCEPTS

The structure of a bird is determined by its bones. A bird has bones in its body similar to our own.
Bones serve as a strong base for the large muscles of the bird.

CLUES TO QUESTIONS

An adult chicken has approximately 125 individual bones.
Younger animals tend to have more bones than older, mature animals.
The chicken has about 60 joints in its body.
The breastbone has the largest surface area since it serves as the base for the powerful chest and wing muscles.
The color of bones varies.
Bones supply rigidity and firmness to the body and provide a base for the muscles and internal organs.

Branching Out:

Many animals do not have bones inside their body.
These lower animals or invertebrates can be roughly divided into two groups: those with no hard body parts (e.g. jellyfish, worms) and those with hard external body coverings (e.g. crabs, insects).

The skeleton of an adult human being contains about 206 bones. Infants have more bones, which fuse together as they grow. (An infant's bones are "soft"; that is, they are mostly made of cartilage. Ossification or hardening occurs gradually with time.)

TROUBLE SHOOTING

- An adult must supervise this activity, especially around the hot water.
- You will have to go to a farm or marketplace to obtain a whole chicken.
- Most people tend to overcook the chicken and as a result the bird falls apart and some of the softer, smaller bones crumble.
- Students get tired cleaning the bones. Have two groups -- one group cleans until they are tired then the second group, your more careful students, takes over.
- Bones may be bleached for display by soaking them in a 10% solution of hydrogen peroxide.
- Copper wire can be used to support the standing skeleton (threaded through vertebrae or holding complex joints).

VOCABULARY

<i>plucked</i>	<i>joints</i>
<i>gutted</i>	<i>function</i>
<i>ligaments</i>	<i>skeleton</i>

RESOURCES

Local high school biology teacher or a taxidermist.

Activity 4:

How is a feather constructed?

TIME

45 minutes

SEASON

anytime

CLASS ORGANIZATION

groups of two

20/DEAD BIRDS

EQUIPMENT AND MATERIALS

For each group:

- 1 contour feather
- 1 100X microscope
- 1 6X hand lens

SKILLS AND TECHNIQUES

- using a simple hand lens
- using a microscope
- sketching and labelling diagrams
- displaying
- using a dictionary

CONCEPTS

A quill feather or contour feather has these basic parts: quill, rachis, and barbs. The rachis and the barbs make up the vane of the feather.

All the parts are lightweight, strong and flexible. Their smoothness reduces air friction so that greater speed may be obtained while the bird is in flight.

SUGGESTIONS FOR VALUE TEACHING

Consider the following situation and circle your position on the value line.

Super tankers
carrying oil to
all parts of the
world may sail
through narrow
straits near
beautiful beaches
and marshes.

No super tankers
carrying oil
allowed in nar-
row straits or
on the open
seas.



CLUES TO QUESTIONS

All the feathers on a bird are called its plumage.

The larger feathers are interlocked by a series of barbs with hooks on them (see chart on page 68).

Air fills the spaces between the feathers and between the feather's parts. This air acts as insulation for the bird and aids it in keeping warm.

When the barbules of a bird's feathers become unhooked, the bird draws each feather through its beak to hook them together again. This is called preening.

TROUBLE SHOOTING

● 100X microscopes are excellent for looking at feathers but most schools do not have them. An effort should be made to obtain at least one. (Senior public schools and high schools are likely to have them.) 40X microscopes are also very useful.

● When drawing diagrams of what they have seen through the microscope, the students tend to draw too large an area and try to illustrate too much detail. Encourage small, limited drawings.

VOCABULARY

<i>preening</i>	<i>pinion feather</i>
<i>barb</i>	<i>contour feather</i>
<i>barbule</i>	<i>rachis</i>
<i>barbicels</i>	<i>plumage</i>

RESOURCES

Local senior elementary science labs or high school labs for microscopes.

Activity 5:

What types of feathers are found on a bird?

TIME

45 minutes

SEASON

anytime except winter

CLASS ORGANIZATION

groups of two

EQUIPMENT AND MATERIALS

For each group:

a variety of all types of feathers
stiff cardboard for mounting feathers
glue

SKILLS AND TECHNIQUES

- displaying
- using an encyclopedia

CONCEPTS

Birds have basically two kinds of feathers on their bodies -- downy feathers and contour feathers. The downy feathers provide warmth while the large, stiffer contour feathers provide shape, color and protection and make flight possible. The structure of downy feathers and the structure of contour feathers remain the same for all birds.

Feathers are shed at least once, and sometimes two or three times a year.

SUGGESTIONS FOR VALUE TEACHING

(a) Sometimes oil tankers have accidents which cause oil spills. If an oil spill should reach a marsh or beach area, who should be responsible for the expense of its clean-up?

Rank the following list in order of who should be responsible for paying the clean-up expenses, first, second, third and so on. If you feel more than one is equally responsible, group them together with a circle around them: taxpayer, local community, local government, federal government, oil company, firemen, people who own the land.

(b) Which group do you think would be the most prompt in cleaning up an oil spill?

CLUES TO QUESTIONS

The texture and feel of birds' feathers differ greatly. Some feathers are hard, stiff, coarse and brittle while other feathers, such as those of owls, tend to be soft, flexible, and extremely smooth. The large, quill feathers of the wing are called primaries.

Some birds are born with no feathers at all. Other birds are born with downy feathers only.

The shedding process is called molting. Molting is gradual, with the bird losing only a few feathers at a time. In this way the bird may continue to fly.

Feathers that appear to change color when viewed from a different angle or when light strikes them from a different angle are said to have *iridescence*.

VOCABULARY

<i>quill</i>	<i>iridescence</i>
<i>molting</i>	<i>waterproofing</i>
<i>downy feather</i>	<i>buoyancy</i>
<i>primaries</i>	

RESOURCES

Local science museums have excellent displays of bird skins which illustrate the two main types of feathers.

Activity 6:

What is the mass of a bird's bones and feathers?

TIME

1 hour to construct the scale
45 minutes to measure and record

SEASON

anytime

CLASS ORGANIZATION

groups of four

EQUIPMENT AND MATERIALS

For each group:

a variety of bird bones and feathers
materials to make a microbalance:

- 1 block of wood 5 cm x 10 cm x 20 cm
- 1 block of wood 45 cm x 10 cm x 2.5 cm
- 1 block of wood 10 cm x 5 cm x 2.5 cm
- 1 stiff piece of cardboard 7.5 cm x 7.5 cm
- 4 nails
- 1 ruler marked in millimetres
- 1 large sewing needle
- 1 hammer
- 1 screwdriver
- glue

SKILLS AND TECHNIQUES

- following directions
- using a given plan to build a piece of equipment
- using a microbalance
- reading a scale

CONCEPTS

The bones and feathers of a bird combine lightness and rigidity.
The bones are porous and in some cases even hollow. This reduces body weight tremendously.

Branching Out:

Detergent or soap will remove the oil on a bird's feathers. As a result, water can soak the feathers and fill the insulating air spaces. This causes birds to lose their buoyancy.
Penguins are birds and their bodies are covered with feathers, not fur.

TROUBLE SHOOTING

● Collecting suitable feathers in good condition is the biggest problem in this activity. Barnyards, beaches, game farms, and chicken farms are good sources. Recently killed wild birds supply excellent examples. Caution must be taken when using dead wild birds. An adult should collect the feathers, lay them out and then spray them with a disinfectant before students handle them.

CLUES TO QUESTIONS

Many bones in a bird contain air-filled cavities, therefore they are very light and generally more delicate than the bones of other animals.
Many of the bones in a bird are fused together for greater rigidity.
The internal structure of the feather is hollow.
Air sacs are extensions of the bird's lungs, therefore birds can withstand prolonged flight without running out of breath.
Commercial turkeys are specially fed, therefore they are heavier.

Branching Out:

The mass of the smallest bird in the world, the hummingbird, is less than 28 g. The mass of the largest bird in the world, the cock ostrich, has been known to exceed 660 kg.

TROUBLE SHOOTING

● Usually some problems arise when attempting to calibrate the microbalance. When it is at rest with nothing on it, mark the point on the scale at the end of the needle zero. If possible calibrate the scale from that point by adding standard gram masses, one at a time. Add one, mark the scale, then add another. If standard masses are not available use coins as outlined on page 70.

VOCABULARY

<i>calibrate</i>	<i>prehistoric</i>
<i>quill</i>	<i>fossil</i>
<i>air sacs</i>	<i>microbalance</i>
<i>delicate</i>	

RESOURCES

Local high school science department.

BIBLIOGRAPHY

FURTHER READING FOR STUDENTS

Austin, Elizabeth. *BIRDS THAT STOPPED FLYING*. New York: Random House, 1969. The intriguing story of why 49 species of birds stopped flying and how they have survived without flight.

Hancock, David, and Woodford, James. *BIRDS OF ALBERTA, SASKATCHEWAN AND MANITOBA. BIRDS OF ONTARIO AND QUEBEC. BIRDS OF THE ATLANTIC PROVINCES*. Don Mills, Ontario: General, 1973. Each volume deals with a specific region of Canada, with facts about native birds and bird watching in each region.

Holden, Robert G. *THE WAYS OF NESTING BIRDS*. New York: Dodd, Mead, 1970. The nesting habits of 49 species of birds are detailed, with emphasis on the individuality of each bird.

Hudson, Robert G. *NATURE'S NURSERY: BABY BIRDS*. New York: John Day, 1971. The author explores the world of birds and their babies.

Kaufman, John. *WINGS, SUN AND STARS: THE STORY OF BIRD MIGRATION*. New York: William Morrow, 1969. The seemingly impossible part of bird behaviour, migration, is the topic covered.

THE NATURE OF BIRDS. Toronto: Natural Science of Canada, 1974. A thorough treatment of Canada's bird population. Excellent photographs.

Provensen, Alice, and Provensen, Martin. *WHO'S IN THE EGG?* New York: Golden Press, 1970. A delightful introduction to eggs of all shapes and sizes.

Schultz, Walter E. *HOW TO ATTRACT, HOUSE AND FEED BIRDS*. New York: Bruce Publishing, 1970. Excellent suggestions on how to attract and keep birds in your area by providing the proper food and housing.

Stone, A. Harris. *THE LAST FREE BIRD*. Englewood Cliffs, New Jersey: Prentice-Hall, 1967. Presented in a poetic form, this book emphasizes the importance of conservation of wildlife.

Wright, Robert. *CURIOUS WAYS OF COMMON BIRDS*. New York: Lothrop, Lee and Shepard, 1971. The author provides an insight into the behaviour and habits of 10 familiar North American birds.

NON-PRINT BIBLIOGRAPHY

BIRDS (Kit) National Geographic Society, 1974.

1 filmstrip, 1 filmstrip text, 1 phonodisc

Representative life cycles of several native North American birds.

BIRDS IN YOUR BACKYARD (Motion picture)

Rev. ed. Arthur Barr Productions, 1966.

11 min. sd. 16 mm

The activities of two boys who wish to attract birds to their yard.

FAMILIAR BIRDS: THEIR YOUNG AND NESTS

(Study print) SVE, 1964.

8 col. photos 13x8 in

Pictures of familiar birds, their young and nests.

FLIGHT OF BIRDS (Motion picture) Film

Associates, 1966.

13 min. sd. 16 mm

A discussion of the principles involved in the flight of birds.

A ROBIN FAMILY (Motion picture) Gateway Productions, 1965.

10 min. s. 16 mm

A record of the 30-day life cycle, during which a pair of robins build a nest and raise a family.

Wetmore, Alexander. *SONG AND GARDEN BIRDS OF NORTH AMERICA* (Kit) National Geographic Society, 1964.

1 book; 6 phono discs

Seventy different bird songs are recorded on the discs, while the book is a comprehensive coverage of North American birds.

FURTHER READING FOR TEACHERS

Arbib, Robert, and Soper, Tony. *THE HUNGRY BIRD BOOK*. Rev. ed. New York: Taplinger Press, 1971.

A guide on turning your garden into a sanctuary for wild birds.

THE PERSONALITY

Crown, 1965.

An anthology of stories and poems about birds, each portraying a distinctive personality trait.

Cromer, Richard. *THE MIRACLE OF FLIGHT*. Garden City, New York: Doubleday, 1968.

Based on a "Wild Kingdom" television program about birds' ability to fly. How flight actually takes place is outlined.

McAtee, W.L. *FOLK-NAMES OF CANADIAN BIRDS*. 2nd ed. Ottawa: Queen's Printer, 1959.

A detailed history of Canadian bird names of interest to those studying birds and/or folklore.

Pettit, Ted. *BIRD FEEDERS AND SHELTERS YOU CAN MAKE*. New York: G.P. Putnam, 1970.

The author explains what food and type of home to offer various species of birds. Well-illustrated instructions.

Simon, Hilda. *FEATHERS, PLAIN AND FANCY*. New York: Viking Press, 1969.

A multitude of information science has learned about feathers, with accurate color and black and white drawings.

Stoutenburg, Adrien. *A VANISHING THUNDER: EXTINCT AND THREATENED AMERICAN BIRDS*. Garden City, New York: Natural History Press, 1967.

An account of bird conservation stressing the threat of extinction to many dwindling species.

FIELD GUIDES

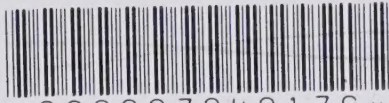
Peterson, Roger Tory. *A FIELD GUIDE TO THE BIRDS*. 2nd rev. ed. Boston: Houghton Mifflin, 1947.

Zim, Herbert S., and Gabrielson, Ira N. *BIRDS: GOLDEN NATURE GUIDE*. New York: Simon & Schuster, 1947.

Bibliography prepared by Evelyn L. Olejnik

QL 673 B62 1977 TCH-GD-
BIRDS

39394728 CURR



000007048176

QL 673 B62 1977 tch.gd.
Birds /

39394728 CURR



Astronomy

Birds

The Dandelion

Ecology in Your Community

Mapping Small Places

Mini-climates

Pollution

Running Water

Small Creatures

Snow and Ice

Trees

Your Senses

ISBN 0-03-922157-1

HOLT, RINEHART AND WINSTON OF CANADA, LIMITED



1338764